Remarks

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. Claims 17 and 69 have been amended. Claims 1-16, 27-68, and 75-91 are currently cancelled, without prejudice, however, Applicants reserve the right to file a divisional application for such claims. Support for the amendments can be found at least in paragraphs 0045 and 0046 of the application as originally filed. Accordingly, Claims 17-21, 23-26, and 69-74 (15 claims) will be pending in the present application upon entry of this Reply and Amendment.

A detailed listing of all claims that are, or were, in the application, irrespective of whether the claims remain under examination in the application, is presented, with an appropriate defined status identifier.

Claim Rejections – 35 U.S.C. §103

On page 2 of the Office Action, the Examiner has rejected Claims 17-19, 21, 23, 24, 26, and 69-73 under 35 U.S.C. §103(a) as being unpatentable over Birckhead et al., US Patent No. 6,536,522, in view of Odachi et al., US Patent No. 6,869,272.

Birckhead is directed to an "artificial lift apparatus with automated monotrain characteristics." Various pressure sensors are disposed in the wellbore and signals from the sensor are used to control a progressive cavity pump (PCP) in the wellbore. (See col. 4, lines 1-23) The Examiner states, on page 3 of the Office Action, that "Birckhead does not disclose that the control method is accomplished without downhole sensors and in the manner claimed."

Odachi is directed to an "electric compressor and control method thereof for an electric compressor used in air conditioning and refrigeration systems." (See col. 1, lines 7-13). On page 3, the Examiner states that "Odachi teaches a control method for controlling a motor driving a compressor wherein an estimation unit 51 measures voltage

and current supplied to a motor 1 and uses this information to determine the speed via a speed control unit 61."

The Examiner goes on to state, with respect to independent Claims 17 and 69 that "It would have been obvious to a person having ordinary skill in the art to have modified the control system of Birckhead with the system of Odachi that identifies situations in which motor parameters need to be adjusted to keep the fluid transfer device operating efficiently."

Claim 17 of the present application is in independent form and recites a "method for controlling a progressing cavity pump for transferring fluid within a fluid system, wherein the progressing cavity pump is coupled through an electric motor" comprising, in combination with other elements,

> determining in real-time values of torque and speed inputs to the progressing cavity pump without downhole sensors by measuring electric voltages applied to the motor and current drawn by the motor, and using the measured values ... to calculate the values of torque and speed input to the progressing cavity pump; using the real-time values of torque and speed inputs to calculate ... performance of the progressing cavity pump, using the ... performance values to produce ... command signals; and using the command signals to control in real-time closed-loop basis the speed of the progressing cavity pump.

Claims 18, 19, 21, 23, and 25 depend from independent Claim 17.

Claims 69 of the present application is in independent form and recites a "pump control system for controlling the progressing cavity pump for transferring fluid within the fluid system, wherein the progressing cavity pump is coupled to an electric motor" comprising, in combination with other elements, a

> means for determining in real-time values of torque and speed inputs to the progressing cavity pump, without downhole sensors, by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and current drawn by the motor to calculate the values of torque and speed

> inputs to the progressing cavity pump; means for using the real-time values of torque and speed inputs to calculate ... performance of the progressing cavity pump; and means for using the progressing cavity pump performance values to produce ... command signals for controlling in a real-time closed-loop basis the speed of the progressing cavity pump.

Claims 70-73 depend from independent Claim 69.

The method of controlling the progressing cavity pump (PCP) and a pump control system for controlling the PCP recited in independent Claims 1 and 69 would not have been obvious in view of Birckhead, alone or in any proper combination with Odachi under 35 U.S.C. §103(a). Birckhead, alone or in any proper combination with Odachi does not disclose, teach or suggest a method for controlling a PCP or a pump control system for controlling a PCP as disclosed and claimed in the present application. The suggestion to make the combination of Birckhead and Odachi have been taken from the Applicants' own specification (using hindsight), with is improper.

The present application discloses and claims that the determination of values of torque and speed inputs into the PCP is done without downhole sensors (see specifically para. 0045 of the present application as originally filed) and in real-time, closed-loop control of the PCP (see at least para. 0018 of the present application as originally filed). The Examiner acknowledges that Birckhead specifically requires sensors in making his calculations and is so taught by Birckhead at least in col. 4, lines 1-6, elements 50a and 50b which are downhole sensors.

Applicants teach, disclose, and claim that the speed of the PCP is determined by measuring electrical voltages applied to an electric motor driving the PCP and currents drawn by such motor. These measurements are done without external instrumentation, specifically downhole sensors (see para. 0019 of the present application as originally filed).

The combination suggested by the Examiner of Birckhead with Odachi does not eliminate the downhole sensor requirement of Birckhead and therefore is not *prima facie* obvious of what is disclosed and claimed in the present application.

The fact that Birckhead teaches the use of downhole sensors (50a and 50b) is itself a teaching away from the present application. The Odachi teaching of controlling a compressor (not a PCP) at a constant torque and then changing to a constant speed is not what is disclosed and claimed in the present application nor art that would compel one ordinarily skilled in the art of progressing cavity pumps to look for inspiration much less to change the operation of Birckhead even if the skilled artisan looked to Birckhead in the first instance. See *Winner International Royalty Corp. v. Wang*, 202 F.3d 1340 (Fed. Cir. 2000).

Odachi teaches that its motor 1 driven at a pre-determined torque when the electric compressor is started, the motor being driven at a pre-determined torque can rotate a certain amount within a short time and then the operation mode of the motor is immediately switched from the constant torque mode to the constant speed mode. Odachi teaches that the motor 1 is driven in the constant torque mode only for a short time. (See at least col. 5, lines 17-32 of Odachi). Applicants submit that that is not what is disclosed and claimed in the present application where the values of torque and speed to the PCP are calculated on a real-time basis and provide real-time closed-loop control of the speed of the PCP.

Further, Applicants submit that the compressor of Odachi is not the same as the progressing cavity pump controlled (and claimed) in the present application. A compressor is not the same as a progressing cavity pump.

As disclosed in the present application, the performance of the progressing cavity pump will change as pump head pressure and flow rate change at the bottom the downhole. As a result, the torque and speed requirements of the PCP will change from time to time and must be controlled in real-time by the electric motor which can be as

many as thousands of feet from the PCP. The compressor of Odachi is attached to the housing of the electric motor and in one embodiment actually forms one of the housing walls of the electric motor. Therefore, one ordinarily skilled in the art of controlling a PCP in a well thousands of feet away from its drive motor would not be compelled to look to Odachi, who controls a compressor adjacent to the motor, to obtain that which is disclosed and claimed in the present application.

Odachi actually teaches away from that which is disclosed and claimed in the present application since as cited above Odachi teaches operating the electric motor at a pre-determined constant torque and then switching to a constant speed. Such operation is not what is required nor disclosed nor claimed in the present application as discussed above and is discussed specifically at least in paras. 17-20 of the present application as originally filed. Combining a constant torque and constant speed motor to drive the downhole pump of Birckhead as suggested by the Examiner would not permit Birckhead's pump to operate in its intended purpose because the Birckhead pump would experience the same types of pump head pressure and flow rate changes experienced by the PCP of the present application which Birckhead addresses with downhole sensors. Further, providing a constant torque switchable to a constant speed motor of Odachi would not eliminate the downhole sensors required by Birckhead and certainly not the efficient operation of a pump at the bottom of a hole. Accordingly, one ordinarily skilled in the art would not be compelled to combine Birckhead and Odachi as suggested by the Examiner and certainly would not result in that which is disclosed and claimed in the present application.

Applicants submit that controlling a progressing cavity pump from voltage and currents drawn by a motor driving the PCP to calculate the values of torque and speed inputs to the PCP is not the same as controlling a pump coupled to a motor that operates only at a constant torque or constant speed.

The Examiner has not articulated a correct reason why one ordinarily skilled in the art of downhole progressing pump cavity control would modify Birckhead as suggested by the Examiner. The reason given by the Examiner is that one ordinarily skilled in the art would combine Birckhead and Odachi in situations in which motor parameters need to be adjusted to keep both fluid transfer device operating efficiently. However, as discussed above, Odachi teaches starting off at a constant torque and then switching to a constant speed. Such operation would not allow for efficient operation of a PCP in a downhole situation because of the various forces that are applied to the downhole pump that require constant monitoring and changing of torque and speed to maximize efficiency as described in the present application. However, the Examiner has not articulated how or why the downhole sensors of Birckhead would be eliminated and still allow Birckhead to operate for its intended purpose for driving a pump in a downhole situation. The Examiner makes similar arguments with respect to independent Claim 69 of the present application. Applicants submit and reiterate their comments with respect to Birckhead and Odachi as applied to Claim 69.

Applicants submit that taken as a whole, the Examiner has not presented a *prima facie* case of obviousness over that which is disclosed and claimed in the present application.

The "method of controlling a progressing cavity pump" recited in independent Claim 17 and the "pump control system for controlling a progressing cavity pump" recited in independent Claim 69, considered as a whole, would not have been obvious in view of Birckhead and/or Odachi. The rejection of independent Claim 17 and independent Claim 69 over Birckhead in view of Odachi under 35 U.S.C. §103(a) is improper. Therefore, independent Claims 17 and 69 are patentable over Birckhead in view of Odachi.

Dependent Claims 18, 19, 21, 23, 24, and 26 which depend from independent Claim 17 and dependent Claims 70-73 which depend from independent Claim 69 are also patentable. See 35 U.S.C. §112, para. 4.

The Applicants respectfully request the withdrawal of the rejection of Claims 17-19, 21, 23, 24, 26, and 69-73 under 35 U.S.C. §103(a).

Allowable Subject Matter

Applicants note that the Examiner has allowed Claims 20, 25, and 74 which are in independent form.

* * *

It is submitted that each outstanding objection and rejection to the application has been overcome, and that the application is in condition for allowance. The Applicant requests consideration and allowance of all pending claims.

The Examiner is invited to contact the undersigned by telephone is it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted:

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